Laparoscopic Duodenoduodenostomy for Duodenal Obstruction in Infants and Children

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Background/Purpose: Duodenal obstruction, such as that resulting from atresia or web, routinely has been corrected by laparotomy and duodenoduodenostomy. Until recently, no one has reported on the use of minimally invasive techniques to correct this congenital anomaly. Over the last 6 months we have approached 4 patients, 3 with atresia and one with a web, laparoscopically. Three were newborns, and one was 8 months old.

Methods: All procedures were performed with 3-mm instruments and scopes.

Results: Operating time in all cases was less then 90 minutes. Visualization was excellent, and there were no intraoperative complications. Feedings were started on postoperative day 5 in all 3 neonates and day 3 in the infant. All 4 were on full feedings after 3 days. Follow-up upper gastrointestinal tests show no evidence of stricture or obstruction.

Conclusion: Laparoscopy provides an excellent way to evaluate and treat congenital duodenal obstruction.

INDEX WORDS: Duodenal atresia, duodenal web, laparoscopy, duodenoduodenostomy.

ALTHOUGH minimally invasive surgical techniques (MIS) have become more commonly used in pediatric surgery, in general there has been less acceptance in the treatment of neonates and congenital anomalies. There are reports citing the use of MIS in the correction of malrotation, intestinal duplications,[1] and even tracheoesophageal fistula,[2] but no series has been reported on the use of laparoscopy to evaluate and treat congenital duodenal obstruction. Accepted therapy has consisted of laparotomy and duodenoduodenostomy with excellent long-term results.[3] Based on our experiences with MIS in neonates to treat other congenital anomalies, we elected to undertake the evaluation and treatment of patients presenting with duodenal obstruction using a laparoscopic approach.

MATERIALS AND METHODS

After obtaining approval from the HealthOne Alliance IRB at Presbyterian/St Lukes Hospital, a study of laparoscopic repair of congenital duodenal obstruction was undertaken. From March 2001 to July 2001, 5 consecutive patients presented with complete or near-complete duodenal obstruction of the second or third portion of the duodenum. Laparoscopic exploration was discussed with all parents, and one newborn was excluded because of a lack of consent. Of the remaining 4 patients 3 were newborns, and one was 8 months of age. Weights were 1.4 kg, 2.4 kg, 2.8 kg, and 6.4 kg. Two of the newborns were suspected to have duodenal atresia on prenatal ultrasound scan. All 3 had a classic double-bubble on abdominal x-ray. The 8 month old had undergone exploration during the first week of life at another institution for a presumed malrotation and then continued to have feeding difficulties. An upper gastrointestinal series (UGI) at 7 months showed a near-complete obstruction between the second and third of the duodenum.

Standard neonatal laparoscopic instruments (3 mm) and trocars were used. The patient was placed supine at the end of the table, and the surgeon stood at the patient's feet. The abdomen was insufflated through an umbilical ring incision, and the first port was placed here. Two other ports, one 3 mm and one 5 mm were placed in the right lower quadrant and left mid quadrant respectively (Fig 1). The 5-mm port was placed for the introduction of the suture. Because of the decompressed nature of the distal bowel, there was abundant intraabdominal space and excellent visualization of the c-loop of the duodenum. In the case of the 8 month old, a fourth port was placed in the right upper quadrant to retract the liver. The duodenum was kocherized, and the site of the obstruction was easily visible in all cases. In the 3 cases of atresia, proximal and distal duodenotomies were made, and a standard diamond anastomosis was performed using 4-0 silk sutures. Stay sutures were placed at each corner to set up the anastomosis, and then the back wall and then front wall were sewn. The distal bowel then was run to look for evidence of other, distal atretic segments. In the case of the 8 month old, a web was suspected, and a longitudinal duodenotomy was made across the area of apparent transition. A web was identified, partially resected, and a transverse closure was performed with running suture.

RESULTS

Operating times were 70, 80, 65, and 90 minutes, respectively. There were no intraoperative complications. No distal obstructions were found. Nasogastric tubes were left in for 4 days in the neonates and 2 days in the 8 month old. Feedings were started the next day.

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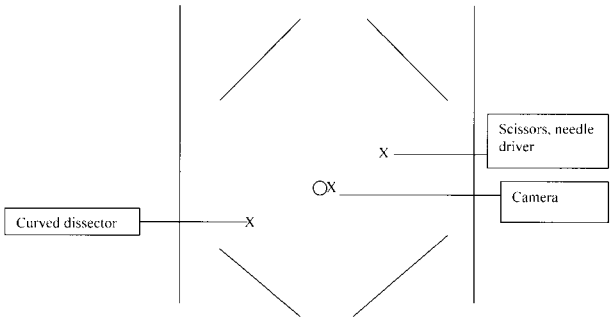

Fig 1. Trocar placement and instrumentation for repair of duodenal atresia.

Two patients with atresia were on full oral feedings by day 8 and the third by day 10. The 8 month old was started on feedings on postoperative day 3 and discharged on postoperative day 5. The infants were discharged on day 10, 14, and 23, respectively. Postoperative UGI has been obtained in all cases. There is no evidence of anastomotic obstruction. Two patients have significant gastric reflux and are on antireflux medications.

DISCUSSION

The application of MIS for the correction of congenital anomalies has increased significantly over the last 3 years. The ability to perform delicate dissection and intracorporeal anastomosis has broadened the scope of entities that can be approached. Although most neonatal conditions presenting with bowel obstruction present a difficult problem for laparoscopy because of the dilated bowel and limited abdominal cavity, this is not the case in duodenal atresia. The entire small and large bowel is decompressed, and there is excellent exposure of the proximal duodenum.

Two unexpected benefits of this technique are the excellent visualization of the site of the obstruction and the ease of the anastomosis. One of the difficulties of performing the duodenoduodenostomy through a standard right upper quadrant incision is constructing the anastomosis between the bulbous proximal segment and the relatively small-caliber distal duodenum. Exposure can often be difficult. With a laparoscopic approach, the scope can be placed directly over the anastomosis, providing excellent visualization. The back wall is seen easily, and because no retractors are necessary, the front wall is nearly approximated to the anterior surface of the distal bowel. The standard diamond type[4] anastomosis thus, is constructed easily without tension.

All three of the atresia patients started feedings early, but it is hard to know if this can be attributed to the MIS approach. Certainly, the minimal amount of bowel manipulation necessary to get exposure may contribute to less ileus. However, all 3 patients were premature, and it may be that the proximal duodenum and stomach were not as atonic, because they were not as dilated. None of the patients required tapering.

One possible disadvantage of this approach may be that evaluation of the distal bowel for other atretic segments is more difficult to accomplish. The bowel can be inspected visually for distal obstructed segments, but internal webs may be more difficult to see. Our approach during open procedures has been to inspect the bowel visually for evidence of distal obstruction, so that the adoption of a minimally invasive technique has not resulted in any change in standard practice. We have reasoned that, because careful visual inspection of the bowel is likely to reveal such obstructing lesions, and the incidence of secondary atretic segments is extremely low ($<2\%$), it is unlikely that distal obstructions will be missed. However, if the surgeon's practice is to infuse the bowel with saline, this will indeed be more difficult to perform laparoscopically.

In this small series, laparoscopic management of duodenal obstruction has proven to be safe and effective and represents an alternative if the surgeon has the appropriate instruments and suturing skills.

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